

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Inhalation Device

We, FISONS PHARMACEUTICALS LIMITED, a British Company, of 12 Derby Road, Loughborough, Leicestershire, do hereby declare the invention for which we pray that 5 a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention is concerned with improvements in or relating to inhalation devices for powder inhalation therapy.

In general, devices for the administration of powders for inhalation therapy require an additional source of power for the dispersion of the powder in the air stream besides that provided by the patients inhalation. Such additional source of power may take the form of a rubber squeeze bulb, or more recently a pressurised liquefied gas propellant in which, for example, the powder is suspended. In order that the optimum effect be obtained it is necessary that synchronisation of inhalation and operation of the additional source of power be achieved. This is a rather difficult technique for the patient to acquire and a number of devices have been proposed to overcome this difficulty. However, such devices are of necessity more expensive than would 30 be an equivalent device not employing an additional source of power.

It is an object of this invention to provide a simple inhalation device for powder inhalation therapy which is actuated solely 35 by the users' inhalation.

According to the invention, therefore, there is provided a powder inhalation device comprising a hollow, lidded bowl having an inhalation mouthpiece connected with 40 the interior of said bowl and extending from the lower side wall of the bowl approximately at right angles to the vertical axis of the bowl, the bowl having means for

holding a container of powdered medicament and being provided with air inlet 45 holes, adapted to permit the passage, through the device, of a turbulent stream of air which is capable of causing break-up and/or dispersion of powder which may be present in the bowl. In general shape and configuration the device may be regarded, for example, as resembling a smokers tobacco pipe. The lid on the bowl of the device should, of course, be removable for insertion of the powder container which 50 is preferably in the form of an open ended cup or small cylindrical cartridge.

The size of the mouthpiece is preferably such that the teeth of the user are kept well apart to permit good inhalation and in 60 a preferred form of the device the mouthpiece is provided with a non-return valve so as to permit only inhalation through the device.

The break-up and dispersion of the powder is effected by means of vibration and turbulence within the air stream on its path from the air inlet or inlets to the mouthpiece. In a preferred form the air inlet would consist of several small holes the total cross-sectional area of which is substantially equal to that of the mouthpiece opening, so as to give as little restriction as possible to the airflow, which may be very important for an old or weak patient. 70 Typically, the inlet holes have a diameter of from 0.05 to 0.1 inches. However, it is preferred that any hole which may be provided in the lid of the bowl have a diameter of from 0.05 to 0.15 inches.

The various inlet holes are preferably all so positioned that they assist in the dispersion of the powder in the air stream. Thus, advantageously, one of the inlet holes is positioned above the powder cup and 85 the column of air from this is directed

[Price 4s. 6d.]

to give a jet stream directed into the cup at such an angle that the powder is blown or sucked out over the rim. The cup may be loosely held in the bowl so that with an off-centre air jet it rattles or vibrates.

The powder on leaving the cup enters the main air stream and the aspiratory effect of this air stream further assists in the emptying of the cup.

- 10 Turbulence may be provided for by arranging that the air stream is given a swirling movement with several air-barriers or swirl reversals. This may conveniently be achieved by arranging the inlets as rows of holes along the course of the desired air flow and adjacent to suitably angled internal vanes; the angle of the vanes being such that each one deflects the air to a circular path and also causes an air barrier for the air from its neighbouring vanes.
- 15 The air will carry the powder in suspension and air barriers as distinct from solid barriers prevent any build up of powder. The vanes may be arranged to give varying angles at different air entry holes to provide for swirl reversals and thus give a greater degree of turbulence and subsequent powder dispersal.

A preferred form of non-return valve at the mouthpiece end consists of a fixed disc with a ring of holes close to the periphery and a floating captive disc with a centre hole. These discs are arranged so that the free floating disc is held towards the mouth during the operation of sucking, allowing a free flow through the peripheral holes of the inner fixed disc and the centre hole of the forward floating disc to the mouth. On blowing instead of sucking, the floating disc is blown against the fixed disc and the material around the centre hole covers the peripheral holes in this fixed disc and closes the through passage. The floating disc has only a predetermined path of travel, provided for by the inner shape of the mouthpiece or sucking end.

The device as a whole may be conveniently manufactured in a synthetic plastic material, such as polystyrene, Bakelite (the word Bakelite is a Trade Mark), nylon or a rigid polyvinyl chloride, and may be wholly or partly transparent so that the working may be observed by the user and the emptying of the cartridge confirmed.

55 In order that the invention may be well understood, an embodiment thereof will now be described with reference to the drawings accompanying the provisional specification in which:

60 Figure 1 is a longitudinal section through a preferred device according to the invention;

Figure 2 is a view along the line A-A' in Figure 1; and

65 Figures 3 and 4 are plan views on a

larger scale, of the valve discs shown in Figure 1.

Referring now to the drawings a powder inhalation device comprises a hollow bowl 1 made of synthetic thermoplastic material 70 and having moulded integral therewith inhalation mouthpiece 2 and powder cartridge support means 3 adapted to hold a powder container 4. Bowl 1 is provided with a removable lid 5 which is pierced by 75 air inlet 6 substantially above cartridge support means 3. Bowl 1 is pierced by radial air inlets 7 and in association with which are arranged baffles 8 (Figure 2). The inhalation mouthpiece 2 is provided with 80 valve means comprising fixed disc 9, provided with peripheral passages 10, and a floating disc 11. Disc 11 is provided with a central air passage 12 and when pressed against disc 9 by exhaled air, substantially 85 seals the mouthpiece from the bowl of the device.

In operation, lid 5 is removed and open cartridge 4 is placed in cartridge support means 3 as shown and lid 5 is then replaced. 90 The user then places mouthpiece 2 in the mouth and sucks which causes the valve means to open and air to enter through inlets 6 and 7. The air from inlet 6 displaces the powder from cartridge 4 and this 95 is then dispersed in the turbulent airflow caused by the entry of air through inlets 7 striking baffles 8, thus ensuring good dispersion of the powder in the air which then passes through mouthpiece 2 to the user. 100 If the user attempts to blow through the device the valve means in mouthpiece closes and thus frustrates the attempt.

#### WHAT WE CLAIM IS:—

1. A powder inhalation device comprising a hollow lidded bowl having an inhalation mouthpiece connected with the interior of the bowl and extending from the lower side wall of the bowl approximately at right angles to the vertical axis of the bowl, 110 the bowl having means for holding a container of powdered medicament and being provided with one or more air inlet holes adapted to permit the passage, through the device, of a turbulent stream of air 115 which is capable of causing break-up and/or dispersion of powder which may be present in the bowl.

2. An inhalation device as claimed in claim 1 in which the powder container is in 120 the form of an open ended cup or a small cylindrical cartridge.

3. An inhalation device as claimed in claim 1 or claim 2 in which the mouthpiece is provided with a non-return valve so as 125 to permit only inhalation through the device.

4. An inhalation device as claimed in any of the preceding claims in which the air inlet consists of a number of small air inlet 130

holes, the total cross-sectional area of which is substantially equal to that of the mouth-piece opening.

5. An inhalation device as claimed in claim 4 in which one of the inlet holes is positioned above the powder cup.

6. An inhalation device as claimed in claim 4 or claim 5 in which the inlet holes are positioned adjacent to internal angled 10 vanes.

7. An inhalation device as claimed in

claim 1 substantially as herein described.

8. An inhalation device as claimed in claim 1 substantially as herein described and illustrated with reference to the drawings. 15

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1,118,341

PROVISIONAL SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale.*

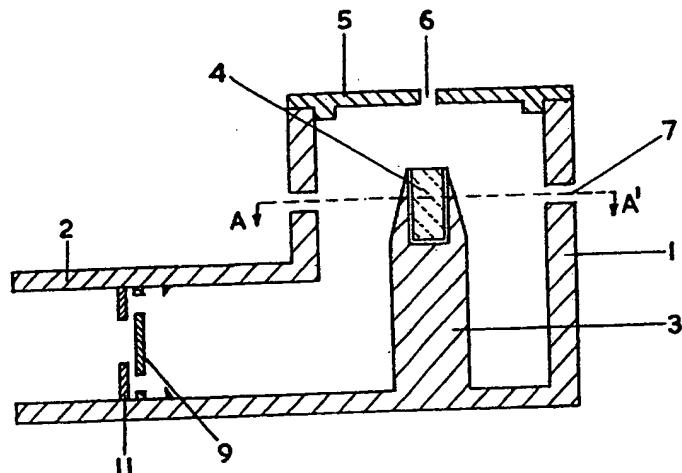


FIG. 1.

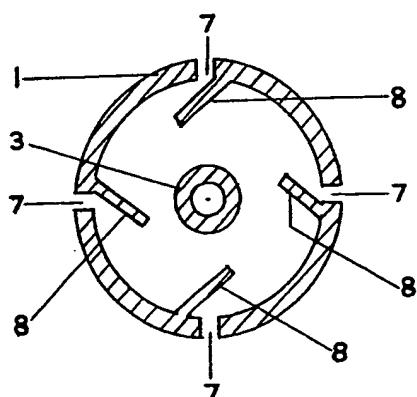


FIG. 2.

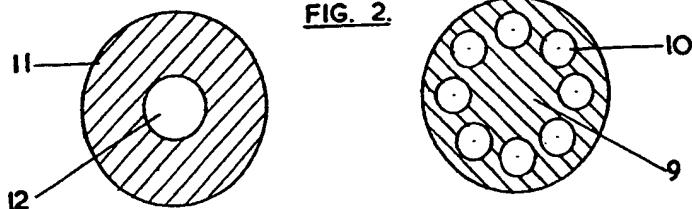


FIG. 3.

FIG. 4.